

Chapter 1: Chemistry and the Science of Matter

1. Using one of the following terms: *element*, *compound*, *solution*, or *heterogeneous mixture*, classify the following materials.

a. methane gas (CH_4)

Answer: compound

b. sugar dissolved in water

Answer: solution (homogeneous mixture)

c. Air

Answer: solution

d. Chocolate chip cookie dough

Answer: heterogeneous mixture

e. Brass

Answer: (Alloy) Solution

f. Zirconium

Answer: Element

2. Determine whether the following properties are physical or chemical by placing an "X" in the appropriate boxes.

Property	Physical	Chemical
Ability to rust		X
Conductivity	X	
Mass	X	
Color	X	
Density	X	X
Flammability		

3. Determine whether the following processes represent physical or chemical changes by placing an "X" in the appropriate box.

Process	Physical	Chemical
Filtration	X	
Decomposition		X
Change in color		X
Crystallization	X	

4. Determine whether the processes are endothermic or exothermic by placing an "X" in the appropriate box.

Process	Endothermic	Exothermic
Freezing of Bromine		X
An explosion		X
Boiling of water	X	

5. Record the technique and property which would be used to separate the following mixtures

Mixture	Technique	Property
A solution of salt water (to yield salt crystals)	Crystallization	solubility
A solution of alcohol and water	Distillation	Boiling point
Spaghetti in a pot of water	Filtration	

6. Calculate the density of a substance if its mass is 10.14 g and its volume is 11.8 mL.

$$D = \frac{m}{V} = \frac{10.14g}{11.8mL} = \boxed{0.859g/mL}$$

7. What is the mass of gold brick that has a volume of 150mL? (The density of gold is 19.3 g/mL)

$$D = \frac{m}{V} \quad m = DV = \frac{19.3g}{mL} \times 150mL = \boxed{289.5g}$$

8. If 156g of mercury were measured in a graduated cylinder, what volume would you observe? (The density of mercury is 13.5 g/mL)

$$D = \frac{m}{V} \quad V = \frac{m}{D} = \frac{156g}{13.5g/mL} = \boxed{11.6mL}$$

Chapter 3: Scientific Measurement

1. Write the following numbers in scientific notation.

a) 103220000

$$1.03220000 \times 10^8$$

b) 0.00453

$$4.53 \times 10^{-3}$$

1. Perform the following calculations and report your answers with proper scientific notation.

$$(6.8 \times 10^{23}) (2 \times 10^{-8})$$

$$1.05 \times 10^4 + 9.8 \times 10^3$$

$$4.32 \times 10^{-4} / 6.5 \times 10^{-12}$$

$$13.6 \times 10^{15} \rightarrow 1.36 \times 10^{16}$$

$$2.03 \times 10^4$$

$$0.66 \times 10^8 \rightarrow 6.6 \times 10^7$$

2. Convert the following.

a. 105 cL to hL

$$0.0105hL$$

b. 0.45 km to dm

$$4500dm$$

c. 10006 mg to g

$$10.006g$$

3. Perform the following conversions using the factor label method. Report your answer in proper scientific notation.

$$1.0 \text{ kg} = 2.2 \text{ lb}$$

$$1.0 \text{ L} = 34.0 \text{ oz}$$

$$3 \text{ ft} = 1 \text{ yd}$$

$$1.6 \text{ km} = 1 \text{ mi}$$

$$1.0 \text{ in} = 2.54 \text{ cm}$$

$$1.0 \text{ m} = 1.13 \text{ yd}$$

$$5280 \text{ ft} = 1 \text{ mi}$$

$$12 \text{ in} = 1 \text{ ft}$$

- a. How many yards are equal to 0.680 km?

$$0.680 \text{ km} \left(\frac{1000 \text{ m}}{1 \text{ km}} \right) \left(\frac{1.13 \text{ yd}}{1.0 \text{ m}} \right) = 768.4$$

Answer:

$$\underline{768.4 \text{ yd.}}$$

- b. How many milliliters are there in 0.00018 oz

$$0.00018 \text{ oz} \left(\frac{1.0 \text{ L}}{34.0 \text{ oz}} \right) \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) = 0.005$$

Answer:

$$\underline{0.005 \text{ mL}}$$

- c. Light travels at $3.00 \times 10^8 \text{ m/s}$; what speed is that in mi/hr?

$$\frac{3.00 \times 10^8 \text{ m}}{\text{s}} \left(\frac{1 \text{ km}}{1000 \text{ m}} \right) \left(\frac{1 \text{ mi}}{1.6 \text{ km}} \right) \left(\frac{60 \text{ s}}{1 \text{ min}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right)$$

Answer:

$$\underline{6.75 \times 10^8 \text{ mi/hr}}$$

Chapter 2: Matter is made of Atoms

1. Complete the following table for the most common isotope

Atomic Number	Mass Number	Number of Protons	Number of Neutrons	Number of Electrons
8	16	8	8	8
7	14	7	7	7
20	41	20	21	20

2. Calculate the atomic mass of element X given the following data.

Isotope	Mass	% Abundance
X-106	105.9035	52.60%
X-107	107.9039	36.46%
X-110	109.9052	10.94%

add

Answer:

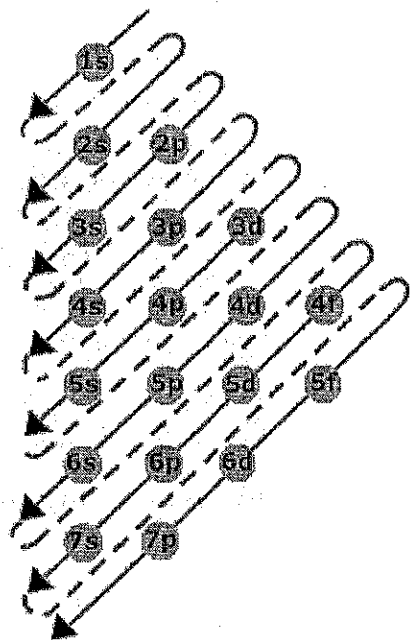
$$\underline{107.0706}$$

3. Write the electron configurations for the following elements using the diagram provided.

Sodium: $1s^2 2s^2 2p^6 3s^1$

Chlorine: $1s^2 2s^2 2p^6 3s^2 3p^5$ or $[Ne] 3s^2 3p^5$

Iron: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$ or $[Ar] 4s^2 3d^6$



4. Answer the following questions using the information given below. Be sure to report your answer in scientific notation.

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$E = h\nu$$

$$c = \lambda\nu$$

a. What is the wavelength, in meters, of light with a frequency of $7.32 \times 10^{19} \text{ Hz}$?

$$c = \lambda\nu \quad \lambda = \frac{c}{\nu} = \frac{3.0 \times 10^8 \text{ m/s}}{7.32 \times 10^{19}} =$$

Answer:

$$4.1 \times 10^{-12} \text{ m}$$

b. What is the energy of a photon of light with a frequency of $2.98 \times 10^7 \text{ Hz}$?

$$E = h\nu \quad E = 6.626 \times 10^{-34} \text{ Js} \times 2.98 \times 10^7 / \text{s}$$

Answer:

$$1.97 \times 10^{-26} \text{ J}$$

c. Which of the two waves above has greater energy? Support your answer using either math or a written explanation.

Energy and frequency are directly related so the wave with the

Chapter 3: Introduction to the Periodic Table

1. Fill in the following table with the correct information.

Element	Chemical Family	Block	Lewis Dot Structure	Most common ion
Strontium	Alkaline Earth Metals	s	$\overset{\circ}{\text{Sr}}\overset{\circ}{}$	Sr^{2+}
Iodine	Halogen	p	$\begin{array}{c} \cdot\cdot \\ \cdot\text{I}\cdot \\ \cdot\cdot \end{array}$	I^{-}
Lead	Other metal	p	$\begin{array}{c} \cdot\cdot \\ \cdot\text{Pb}\cdot \\ \cdot\cdot \end{array}$	Pb^{4+}
Chromium	Transition metal	d		
Berkelium	Inner transition metal	f		
Antimony	Metalloid	p	$\begin{array}{c} \cdot\cdot \\ \cdot\text{Sb}\cdot \\ \cdot\cdot \end{array}$	
Rubidium	Alkali metal	s	$\overset{\circ}{\text{Rb}}\overset{\circ}{}$	Rb^{+}
Sulfur	non-metal	p	$\begin{array}{c} \cdot\cdot \\ \cdot\text{S}\cdot \\ \cdot\cdot \end{array}$	S^{2-}

2. Which of the atoms in each pair is the largest?

a. Calcium or Strontium

b. Oxygen or Nitrogen

3. Which of the atoms in each pair has the greatest electronegativity?

a. Fluorine or Bromine

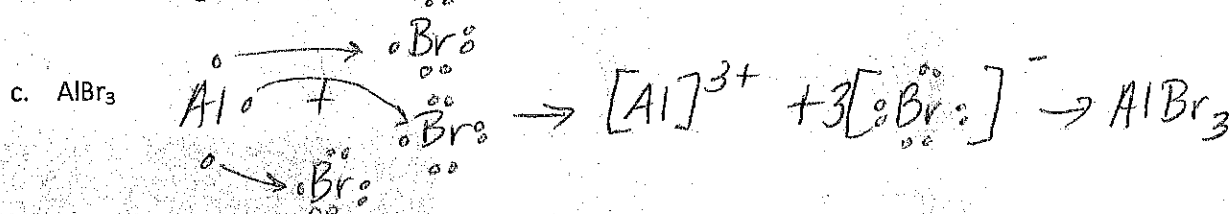
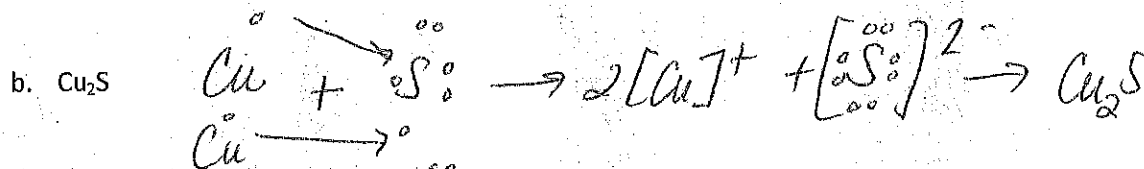
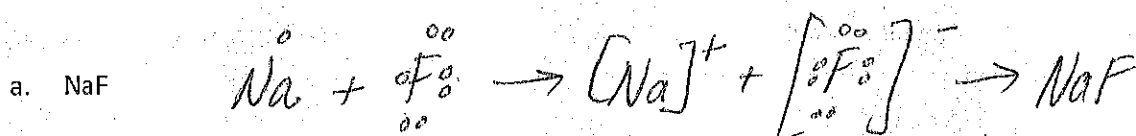
c. Sulfur or Oxygen

4. Which of the following elements are generally solids that conduct electricity?

Copper, Chromium, Phosphorus, Lead, Iodine, Xenon

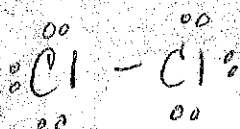
Chapter 4: Formation of Compounds

1. Write the ionic equations for the formation of the following compounds.

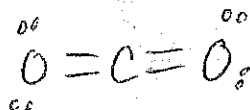


2. Draw the structural formulas for the following compounds.

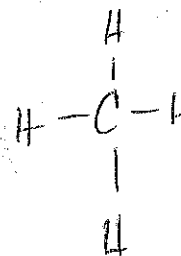
a. Cl_2



b. CO_2



c. CH_4



Chapter 5: Types of Compounds

1. Fill in the ionic compound table below.

Formula	Cation	Anion	Name
Na_2S	Na^+	S^{2-}	Sodium Sulfide
Li_3N	Li^+	N^{3-}	Lithium nitride
BaSO_4	Ba^{2+}	SO_4^{2-}	Barium Sulfate

2. Fill in the covalent compound table below.

Formula	Name
SO_2	Sulfur dioxide
N_3Br_7	trinitrogen hepta bromide
P_4F_6	Tetraphosphorus hexafluoride